

NSCAT Observations of Tropical Cyclone Winds

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Accurate measurements of surface wind fields are crucial for the forecasting of tropical cyclone intensity and tracks. The accuracy of satellite scatterometer observations of tropical cyclones is influenced by the sensitivity of radar backscatter to wind velocity and the scattering and attenuation by rain. It has been found that the maximum wind speeds of hurricanes Lili and Isidore in the NSCAT wind products processed with the NSCAT-1 geophysical model function could be lower than the analysis of geostationary satellite imagery and/or in-situ observations by more than $10\text{-}20\text{ m}\cdot\text{s}^{-1}$. To improve the geophysical model function (GMF) for spaceborne Ku-band scatterometers, the Hurricane Ocean Wind Experiment (HOWE) was conducted in September 1997 with a set of NASA P-3 aircraft flights over the Hurricane Erika. Onboard the NASA P-3 includes a dual-polarized Ku-band scatterometer (NUSCAT) developed by the Jet Propulsion Laboratory (JPL). The surface wind speed was acquired by the GPS dropsondes and was in the range of $20\text{-}35\text{ m}\cdot\text{s}^{-1}$. Clear wind direction signals are observed in the NUSCAT measurements. Augmenting the NSCAT data with the NUSCAT HOWE data set, we derive an improved Ku-band GMF for NSCAT in the high wind regime. The NSCAT backscatter observations of two Atlantic hurricanes, twelve western Pacific typhoons and southern Pacific tropical cyclones were reprocessed with the improved GMF. It is noted in the NSCAT images of processed tropical cyclones that there are spiral features similar to the spatial characteristics of rain bands. A comparative analysis of colocated SSM/I rain rates and NSCAT images supports this observation and suggests techniques for rain flagging and corrections. It is shown that there is a significant improvement in the reprocessed NSCAT winds of tropical cyclones with the maximum wind speed in better agreement with the wind speed derived from the geostationary imagery based on Dvorak's technique, aircraft reconnaissance flight data and ship observations.